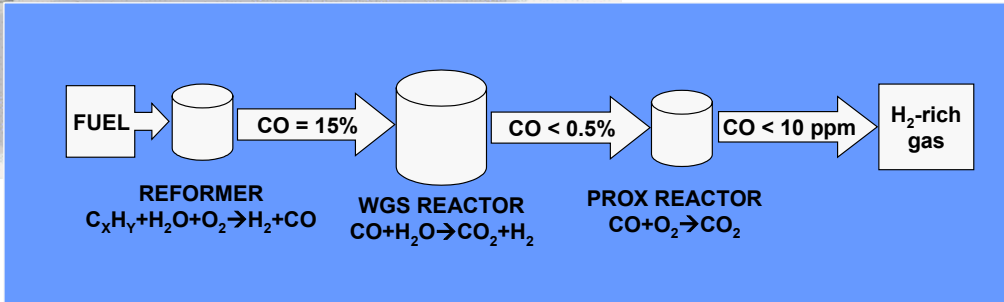
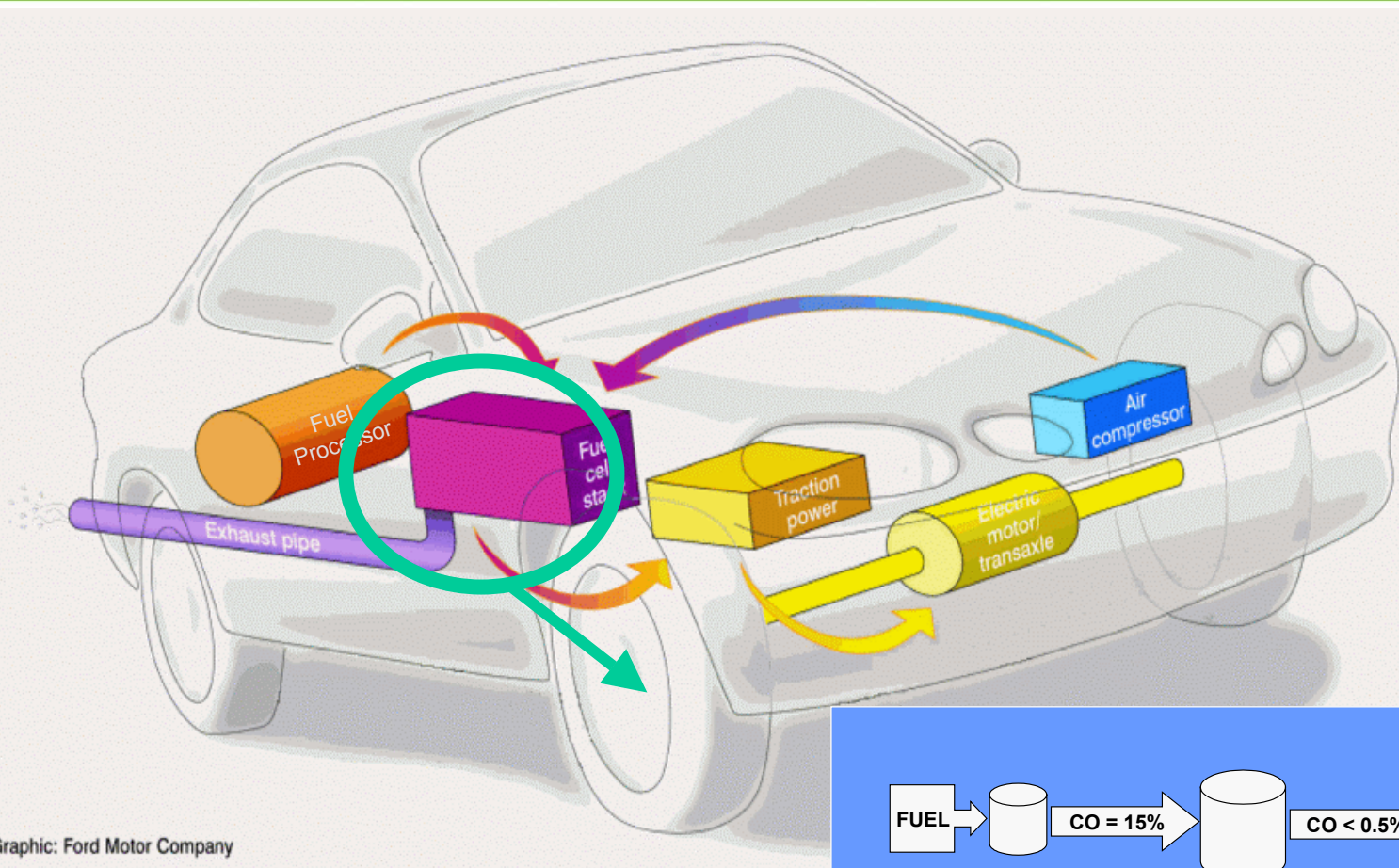




U.S. Department of Energy
Energy Efficiency and Renewable Energy

Fuel Processing

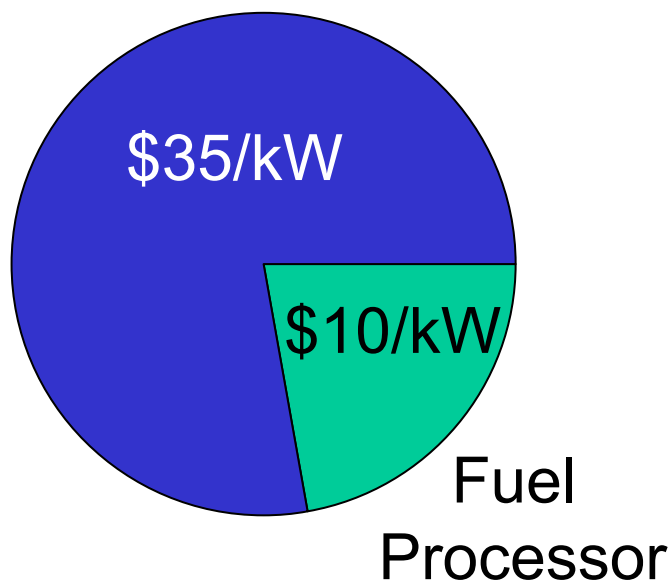


Valri Lightner



On-Board Fuel Processing Barriers

Fuel Cell Power Systems
\$45/kW by 2010



BARRIERS

- Fuel processor start-up/transient operation
- Durability
- Cost
- Emissions and environmental issues
- H₂ purification/CO cleanup
- Fuel processor system integration and efficiency





On-Board Targets and Status

Fuel Processor for 50 kWe (net) Fuel Cell Systems

Fuel processor generating hydrogen-containing fuel gas from reformulated gasoline containing 30 ppm sulfur, average

Characteristics	Units	2003 status	2005	2010
Energy efficiency	%	78	78	80
Power density	W/L	700	700	800
Cost	\$/kW	65	25	10
Durability	Hours	2000	4000	5000
Cold start-up time to max power @ +20°C ambient temp.	Min	<10	<1	<0.5



Fuel Processing Posters

- Fuel Processing of Diesel Fuel for APUs NETL
- Sulfur Removal from Reformate ANL
- Evaluation of Partial Oxidation Fuel Cell Reformer Emissions TIAX, LLC
- Diesel Reforming ANL
- Fast Start Reformer Components LANL, ORNL, and PNNL
- Selective Catalytic Oxidation of Hydrogen Sulfide ORNL



Discussion Points

- Go/No-Go review in late 2004 to determine the future course of on-board vehicle fuel processing activities. Review will focus on ability to meet <0.5 minute start up time to minimize the energy penalty and other critical technical target.
- Emphasis on stationary reforming, auxiliary power, and improved water gas shift catalysts.





Fuel Processing Projects

- Water-Gas Shift Catalysis
- Catalysts for Autothermal Reforming
- Water-Gas-Shift Membrane Reactor
- Hydrogen Enhancement

ANL

ANL

Ohio State
University

UTRC



Fuel Processing Projects

Continued

- Advanced High Efficiency Quick Start Fuel Processor for Transportation Applications Nuvera Fuel Cells, Inc.
- Fuel Cell Distributed Power Package Unit: Fuel Processing Based on Autothermal Cyclic Reforming GE
- Plate-Based Fuel Processing System Catalytica
- Quick-Start Fuel Processor ANL
- Microchannel Steam Reformation of Hydrogen PNNL
- Fuel Processors for PEM Fuel Cells University of Michigan